REMARKS

Claims 1–19 are currently pending in the application. In an Office Action dated May 18, 2005 ("Office Action"), the Examiner rejected claims 1, 2, and 19 under 35 U.S.C. § 102(e) as being anticipated by Hockaday et al., U.S. Publication No. 2001/0049045 A1 ("Hockaday"), or, alternatively, as obvious over Hockaday under 35 U.S.C. § 103(a), rejected claims 6 and 7 under 35 U.S.C. § 103(a) as being unpatentable over Hockaday in view of Vieira et al., U.S. Patent No. 5,098,477 ("Vieira"), rejected claims 10 and 11 under 35 U.S.C. § 103(a) as being unpatentable over Hockaday and Vieira in view of Bauer, U.S. Patent No. 4,523,852 ("Bauer"), rejected claims 12-15 under 35 U.S.C. § 103(a) as being unpatentable over Hockaday and Vieira and in further view of Bauer, U.S. Patent No. 4,523,852 ("Bauer"), and rejected claims 8 and 9 under 35 U.S.C. § 103(a) as being unpatentable over Hockaday in view of Beecher et al., U.S. Patent No. 5,192,984 ("Beecher"). The Examiner objected to claims 3-5 and 16-18 as being dependent on a rejected base claim, but indicated that these claims would be allowable if rewritten in independent form. Applicant's representative respectfully traverses all of the claim rejections.

The issues regarding the current application have been discussed at length, both in written correspondence and in a telephone interview on December 14th, 2004. Applicant's representative was under the impression that a resolution had been reached in that phone interview, and is somewhat surprised that the Hockaday reference has again been cited, since Hockaday's indicator change results from change in the concentration of a dye as the volume of fuel remaining in the fuel tank of a fuel cell decreases. By contrast, the current claims are directed to a fuel indicator system involving a dye or dye mixture that changes color in response to decreasing methanol concentration of a constant volume of fuel in a fuel reservoir. One way of distinguishing the claimed dye from Hockaday's dye would be to characterize the currently claimed dye as "chemically responsive." However, upon further reflection, Applicant's representative elected to more specifically characterize the dye as "a dye or dye mixture with a characteristic wavelength of light absorption or light emission that changes in response to changes in fuel concentration within the volume of the fuel solution." The phrase "that changes in

response to changes in fuel concentration" is meant to modify "characteristic wavelength." The phrase "chemically responsive" would seem to be somewhat less descriptive, in Applicant's representative's opinion. However, judging from the Examiner's comments, it appears that the Examiner perhaps has read a meaning from the amended claim language different from the intended meaning, and Applicant's representative has therefore endeavored, in the above amendments, to more precisely claim the dye element as "a dye or dye mixture with a characteristic wavelength of light absorption or light emission, the characteristic wavelength changing in response to changes in fuel concentration within the volume of the fuel solution" in claim 1, and has similarly amended claims 12 and 19.

Change of a characteristic wavelength at which a compound absorbs or emits light is an indication of a change in the chemical state of a compound, or change in chemical composition of a substance, and is the basis for myriad analytical techniques for detecting changes in the chemical composition of substances during reactions and other processes of interest. When the characteristic wavelength of a dye changes in response to fuel concentration, the dye is most certainly chemically responsive to fuel concentration.

The Examiner's comments with regard to Hockaday, darker dye color, and the Beer-Lambert relationship are incorrect, and somewhat misleading. First, the Beer-Lambert relationship is normally expressed as:

$$A_\lambda = \varepsilon_\lambda bc$$

where the terms have the meanings noted by the Examiner, with the exception that the absorbance A_λ and molar extinction coefficient ε_λ are specifically designated to be wavelength dependent by the subscript λ. The Beer-Lambert relationship, actually an approximation accurate only over a range of concentrations, expresses the change in absorbance, *at a particular wavelength of light* λ, of a solution of a light-absorbing compound as a function of the compound's concentration. Most colored compounds absorb light at one or a few particular, characteristic, peak wavelengths and frequencies. Providing that the molar extinction coefficient ε_λ is relatively independent of concentration, a change in concentration of a substance results in a change in the *intensity* of light transmitted through a solution of the substance, rather than a change in the color

of light transmitted by the solution. By contrast, a change in the color of a substance is normally associated with a change in the chemical state of the substance, such as a change in the electrical states of atoms or molecules, rearrangement of bonds, increase or decrease in resonance, and other such changes. In a mixed solution of dyes with different characteristic wavelengths, color changes may be obtained by changing the *relative* concentrations of the dyes. In other words, a change in the chemical composition of the solution may result in a color change, in the case of a solution of two or more dyes. However, to describe Hockaday's system as showing fuel concentration by a color change is not chemically correct. Change of a light blue solution to dark blue is not a color change, but rather an intensity change. The term "darker color" is, from a scientific standpoint, somewhat self-contradictory. Darkness relates to the shade, or intensity, of light, while color is related to the wavelength or wavelengths of light. The Beer-Lambert relationship is a relationship between light intensity and concentration, and not between color and concentration. Color is a constant in the Beer-Lambert relation, as designated by the subscript λ.

Hockaday does not teach, mention, or suggest "a dye or dye mixture with a characteristic wavelength of light absorption or light emission, the characteristic wavelength changing in response to changes in fuel concentration within the volume of the fuel solution." The change in intensity of transmitted light in Hockaday's system is simply a change in the absorbance A_λ of the solution due to a change in concentration c of the dye as the volume of fuel decreases, as expressed by the Beer-Lambert relationship, and is not a change in the characteristic wavelength of light absorption λ.

The Examiner notes, in the Office Action, that no arguments were directed by Applicant's representative to the secondary references. In Applicant's representative's opinion, the rejections principally depend on Hockaday, and when Hockaday is shown to neither teach, mention, nor suggest that for which Hockaday was cited, the secondary references are insufficient to carry the rejections. Viera discloses inks for ink-jet printing, and makes no mention of inks or dyes that are responsive to fuel concentration changes. Bauer discloses a method for visually comparing results of colorimetric analytical tests, and also makes no mention of dyes that are responsive to fuel

concentration changes. Beecher discloses an analytical instrument that uses microwaves to determine sample concentrations, and also makes no mention of dyes that are responsive to fuel concentration changes. Applicant's representative cannot discern any relevance of Viera, Bauer, or Beecher, alone or in combination, to the currently claimed invention.

All of the claims remaining in the application are now clearly allowable. Favorable consideration and a Notice of Allowance are earnestly solicited.

Respectfully submitted,
Makarand P. Gore
Olympic Patent Works PLLC

Robert W. Bergstrom
Registration No. 39,906

Enclosures:
Postcards (2)
Transmittal in duplicate

Olympic Patent Works PLLC
P.O. Box 4277
Seattle, WA 98194-0277
206.621.1933 telephone
206.621.5302 fax